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Monthly Engineering Report No. 7

Improvement of Wide-Band FM Radar Detection Techniques

Period Covered: 1 April 1961 to 30 April 1961

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General Comments

This report covers the seventh period of contract activity for improvement of FM radar detection techniques.

The job has been staffed by a Consulting Project Engineer and a Senior Engineer working part time as required. Four full time engineers have complemented the contract staff. The period has been devoted to continuation of efforts of the last period.

Activities of the Report Period

The basic work on the broadband serrodyne translator has been continued and specifications have been established to provide for the purchase of a Ku band travelling wave tube. The Huggins HA-49D generally meets these specifications and it is anticipated that this tube will be purchased for the translator. In the meantime, work is continuing to examine other properties of the translation technique as used to establish an intermediate frequency. The current work principally involves swept operation of the band. The sawtooth used for modulating the translator has an improved flyback characteristic now equal to 2%.

The swept power supply for the backward wave oscillator is now being packaged. The Varian VA-162 has been received and tested and is ready for operation with the swept supply.

As previously reported, several different approaches are being taken toward the implementation of gated filters for use in the analysis system. First, a bridge-T null network has been designed and tested. A bank of these filters would simultaneously reject all frequency components and unbalancing circuits would be successively gated for readout. The second method would employ a similar bridge-T in a degenerative feedback arrangement to achieve an active filter. Another approach to the active filter employs the principle of Q-multiplication. Finally, a bank of mechanical filters employing tuning forks may provide a high Q integrating filter. Each of these active types would be sequentially sampled for information readout.

The design of the timing circuitry for the system is virtually complete and construction of the breadboard is under way.

The requirements of a focusing antenna have been previously discussed. It has been decided to construct an ellipsoidal reflector not to exceed 2 feet in diameter to provide a 2-inch focusing action at a distance of approximately 3 feet. The design of a reflector has been made and subcontract quotations are now being procured. A scanning mechanism sufficiently strong to carry the travelling wave tube and the backward wave oscillator is also being constructed. As a result, all radio frequency elements will be mounted near the antenna feed circuits.

Program for the Ensuing Month

The principal effort will be the continuation of work on the aforementioned techniques. Specifically, the design of amplifiers, active filters, antennas and scanning mechanism will be further implemented.